

Accelerator Systems Division Highlights for the Week Ending July 19, 2002

ASD/LBNL: Front End Systems

The last shipment with Front End equipment has arrived at Oak Ridge on Monday, July 15, undamaged. This completed the series of shipments exactly as scheduled.

Most of the former Front-End staff has by now been released from the FES roster; we are still working on completing the documentation for some subsystems.

ASD/LANL: Warm Linac

We are 75 hours through the 96-hour heat run, at 2.5 MW and full duty, on the Marconi 402.5-MHz klystron SN 3. (WBS 1.4.1.1)

Two more RT klystron transmitters were shipped to and received at ORNL. (WBS 1.4.1.1)

The first CPI 550 kW 805-MHz klystron has achieved full power, bandwidth and gain at the factory. Efficiency is currently at 62 - 63%, (spec = 65%) at 11.6 A (spec = 11.4 A). (WBS 1.4.1.1)

The prototype high-voltage converter modulator (HVCN) operated without fault for 75 hours this week in support of Marconi klystron heat run. (WBS 1.4.1.2)

Two HVCN production SCR controllers from Dynapower arrived at LANL. (WBS 1.4.1.2)

LANL personnel were at Dynapower to support production converter modulator assembly. (WBS 1.4.1.2)

Consultant, Bill North, was at LANL to review the HVCN design and performance data. (WBS 1.4.1.2)

The LLRF near-term schedule status and results submitted to ASD. (WBS 1.4.1.3)

The LLRF group work focused on DPS code development and FRCM motherboard/DSP interface. (WBS 1.4.1.3)

The LLRF PLD code was sent to ORNL. (WBS 1.4.1.3)

The LLRF HPM manual was sent to JLAB. (WBS 1.4.1.3)

Vacuum leaks were discovered in three more DTL Tank #3 drift tubes, after helium pressurization tests were performed. Consequently, all DTL Tank 1 drift tubes were shipped back to LANL for similar inspection. LANL personnel are currently in the process of testing these drift tubes, and will work through the weekend. We expect to have tests complete by early next week. (WBS 1.4.2.2)

Coronado and LANL have agreed to temporarily suspend all e-beam weld related activities associated with the DTL drift tubes until we complete the vacuum tests on the delivered drift tubes for Tank 1. (WBS 1.4.2.2)

A metallurgist in LANL Materials Science and Technology Division is in the process of examining an e-beam weld sample from the DTL supplier. Our goal is to provide insight into the microstructure of the joint. Results are expected next week. (WBS 1.4.2.2)

Approximately half of the slug tuners for the remaining DTL tanks are complete, while the remaining items are ready for the hydrostatic flow tests. The access and vacuum ports for the remaining DTL tank are approximately 65% complete. (WBS 1.4.2.2)

Two more DTL endwalls are ready for shipping from Major Tool Corp. We are in the process of evaluating their inspection documentation. (WBS 1.4.2.2)

LANL shipped two different prototype drift tube stiffening fixtures (Fig. 1) to ORNL for evaluation. John Bernardin traveled to ORNL to participate in these tests as well as vacuum tests. (WBS 1.4.2)

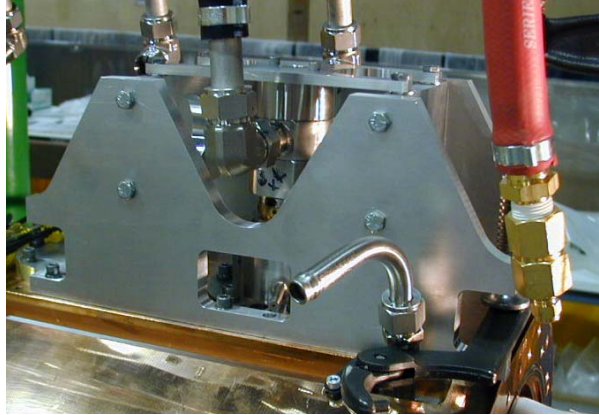


Fig. 1: One of two prototype drift tube stiffening fixtures provided by LANL.

Permanent property transfer of LANL bar-coded items to ORNL has begun. This week LANL bar codes were retired for a water pump treatment cart, a water refrigeration unit, and two laptops computers. (WBS 1.4.6.1)

LANL workers at ORNL this week include John Bernardin (DTL stiffening prototype tests) and Scotty Jones (safety plan implementation)

LANL visitors at ORNL this next include J. Bradley and P. Torrez (high-power Rf installation), R. Martineau (DTL stiffening prototype tests) and B. Quintana, G. Salazar, and D. Warren (Epics racks layout and assembly).

ASD/JLAB: Cold Linac

Repair of the cave shield door was completed during the week, and high power testing resumed after recertification of the Personnel Safety System. Low power tuner measurements took place while the repair was being done. Once high power operations resumed, protracted running of one cavity at gradients in excess of 20 MV/m took place. Coupler performance at this high level was excellent.

ASD/BNL: Ring

Vendor bids for the Ring dipole power supply are due this week. The original bid due date was extended to July 18th at the request of one of the vendors.

Efforts were initiated this week to provide an internal mechanism for an improved means of Configuration Control of the Ring and Transport magnet/power supply design and operating parameters.

Low Level RF System – BNL engineers sent copies of a position paper to ASD via e-mail and overland mail on Wednesday.

21Q40 (60) – Tesla reported that they shipped six more units to BNL. Upon receipt, our inventory will reach seventeen (17) units.

30Q58 first article: QA inspections are nearly complete. Survey and mechanical inspections are underway (pressure and flow tests are complete). The magnet will be surveyed into the test stand next week for field measurements and acceptance testing.

New England Techni-Coil was the successful bidder on the Chicane No. 2, 3 and Dump Septum magnets. A PO will be issued next week.

Bids are out for the 27CD30 corrector magnet. Bids are due back by 7/26/02.

Travel plans are being made for Bill Birkholz's visit to Alpha Magnetics next week to review and inspect their first article 41CDM30 (9) corrector magnet. An issue has been raised regarding the coil's crossover connections.

The test stand is operational for the Ring dipole (RH) magnets. As of this week, four RH magnets have been measured. One did not need shimming and, thus, has been fully measured at 1.0 and 1.3 GeV; shims have been prescribed for the other three; and, the prescribed shims have been installed in two of the three magnets. Soon, our focus will shift to measuring the 21Q40 production quadrupoles.

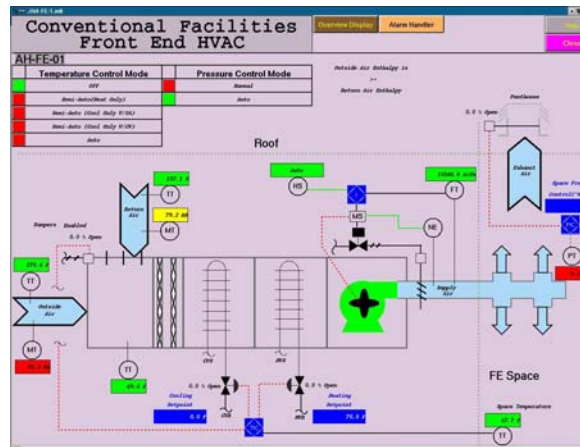
Our Diagnostics Group is working on the agenda and presentations for the Diagnostics Design Reviews to be held via videoconference on July 23, 24 and 25.

Production of BPM PUEs continues, with a total of 32 ea of 21 cm Ring and 10 ea of 21 cm HEBT delivered to the Vacuum Group.

RTBT Vacuum – We continue with the design details of the magnet chambers and the drift space pipes.

Controls

This was a week of dramatic developments at the site for the Controls Team. All control system Local Area Networks are in place, and several servers are installed and running. The first site EPICS IOC is running and displaying data from the Conventional Facilities Air Handling Unit. This data can be viewed through the control system firewalls on the public network, for example at 701 Scarboro Road. An example screen, printed at Scarboro, is shown below. Data is live.



All RCCS racks for the DTL have been completed at the Rack Factory, delivered to RATS and are ready for installation at the site.

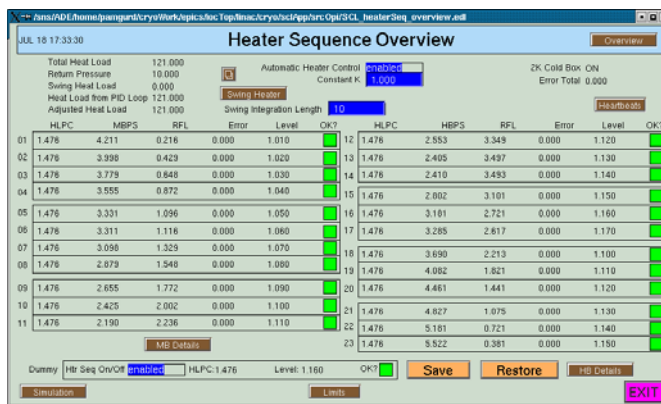
The long-promised PCR to adjust the WBS 1.9 spending plan and to reflect the actual plans for support of beam diagnostics was reviewed and approved by management this week.

The controls team at LANL supported the 96-hour HPRF Klystron test run, developing new EPICS oscilloscope support software for that purpose. Software is complete for the preliminary low-level RF frequency and resonance control module (LLRF FRCM) register map, although changes are expected.

In collaboration between BNL and ORNL, timing system hardware and software has been fixed to correctly handle interrupts on the event encoder module. The event link software has been updated to reflect these changes and to comply with the recommendations of the January software review.

Consoles targeted for the Jlab test stand arrived this week, and have been configured for shipment to Jlab next week.

The first version of the EPICS database for Medium Beta Cryomodules 1 - 4 is complete. This database contains the information for approximately 100 cryogenic related signals for each of these cryomodules. Twenty-four EPICS Engineering Screens have been developed to display all of the cryomodule signals, including the transfer line distribution system and specialized screens developed for simulation and checkout of the sequence for cavity heater control. One example screen is shown below.



The components required to support cryomodule testing at Jefferson Lab have been received and assembled. The PLC inputs and outputs have been wired to the cavity heater power supply and the supply connected to a test load. The PLC logic for controlling the cavity heater power supply was successfully tested. Testing with the EPICS system will be performed next week.

The Central Helium Liquefier Management Rack from DCS was received this week. The front side of these racks houses the PLC for control and monitoring of the Gas Management and Warm Compressor systems. The back side houses the Utility PLC that controls and monitors the helium gas purification system, liquid nitrogen, instrument air, cooling water, guard vacuum, and other utilities.

At BNL, preliminary EDM screens have been developed for the Beam Dump temperature monitoring system. One of these screens is shown below. The System is ControlLogix PLC based. Selected temperature channels above a threshold limit trigger an input to the MPS system. Using these EDM screens, the PLC ladder logic has been verified (using analog input modules while waiting for the thermocouple input modules to arrive).



Installation

Two Marconi 402.5Mhz 2.4MW klystrons, one for the RFQ and one for DTL#1, were installed in their transmitters in the klystron gallery Sunday morning July 21.

The last shipment of Front End components arrived from LBNL on Monday, 7/15 as scheduled and intact.

The Front-End Blue Box "**Smurf Castle**" found it's final resting place. The IS Matching network was installed. The IS/LEBT safety cage was adjusted to the proper height and is completely assembled. Wireways between the diagnostic timing cable spools and the FE racks are installed. The 36 heliax lines from the Klystron Gallery to the RFQ are pulled and awaiting the finish of a tray for routing over the top of the RFQ. The transformer rack was assembled and FER03 is in its final position. FER04 was moved into position and the wireway and conduits from it assembled. All racks (except FER04 and FER02) have been filled with chassis. All racks were bolted to the floor. MEBT quad cables are currently being routed and verified. The Hot Deck inside the Blue Box was installed. Fans were installed on the Blue Box and FER03 as well as the signal lights. The IS re-entrant flange, LEBT, and tilt mechanisms were all installed on the LEBT chamber.

Accelerator Physics

M. Doleans and S. Kim are analyzing data obtained from the JLAB prototype cryomodule last week. They are studying the mechanical modes measured by exciting the piezo and recording the detuning with low RF power.

A. Shishlo and J. Holmes have ported the ORBIT code to the ORNL EAGLE supercomputer to carry out beam dynamics simulations.

The new AP cluster is up and running.

L. Kravchuk has completed the specifications for neutron detectors to be used in conjunction with loss monitors in the linac.

S. Alexandrov is providing material for the operator-training manual that is being assembled by the Operations Group.

Operations Group

A successful meeting with the Accelerator Safety Review Committee (ASRC) (with Ed Lessard from Brookhaven as chair and Bob Mau from Fermilab representing the committee), Les Price (the DOE Project Manager for SNS), Devon Nelson (the author of the implementation guide for the DOE Accelerator Safety Order 420.2A), SNS ES&H and ASD management, on the review of the Final Safety Assessment Document (FSAD) for the Front End, Linac and Klystrons (FELK). This is one of the core documents that need approval for the Accelerator Readiness Review that in turn is needed before operation of the Accelerator. The meeting included a presentation by Mike Harrington, "FSAD-FELK Review Summary", and a presentation by ASD Operations on the "Plan of Action for Accelerator Readiness Reviews, Commissioning, the Accelerator Safety and Operational Envelopes". The ASRC will now submit their recommendation to Les Price, the DOE Project Manager, for the approval of the FSAD-FELK.

We also continue to help work on: the Electronic Logbook (Elog) project, with the goal of releasing the first version of Elog for use in a few weeks. The Equipment Tracking System, providing one-on-one training and guidance on extending its capabilities. Modification of Lock-Out-Tag-Out (LOTO) procedures. And, of course, we continue to work on writing Training information and Operations Procedures.

Ion Source Group

Mechanical Group

Magnet Systems

Vacuum Task

Parts for the DT tripod stabilization frame (designated ORNL-1) are being fabricated and are due to be completed this week. Preliminary tests will be conducted on DTL-3.

The tube stabilization scheme (designated ORNL-2) has been fabricated and install in DTL-3 in preparation for preliminary tests.

Parts for the collet stabilization scheme (ORNL-3) are currently being fabricated.

Two DT stabilization schemes have been designed and fabricated by LANL (designated LANL-1 and 2) and is due to be received at RATS early next week for testing.

All vacuum components on the front end have been re-installed; the pump control cable runs remain to be completed. Final leak checking of the rebuncher to BPM 5, the seals of the cryopumps to RFQ and the turbopump seals to the MEBT and LEBT need to be completed. The MEBT and RFQ achieved a pressure of 1 mTorr after 1 hour of pumping.

Gross leak testing of DTL-3 was suspended following the identification of 10^{-5} range leaks at both tank flange joints. Each flange joint was disconnected, and the seals and the surface finish of the O-ring groove and mating flanges inspected. A bad splice was found on both O-rings and new O-rings were ordered. Significant scratches, blemishes and damage were identified in the O-ring groove and on the mating flanges both areas required to be mechanical polished by hand to corrected. Some local copper plating was removed during in the dressing process. The new O-rings were received and baked for 24 hours prior to reinstalling. Following this rework leak testing re-commenced at the end of the week. Pressure during leak testing is now in the low 10^{-3} Torr range a significant improvement from the 5 mTorr recorded prior to repair of the tank flange joints. However, this pressure would indicate that a significant integrated leak rate, probably in the 10^{-4} Torr-l/s range, is present. Testing will continue next week to locate and quantify further leaks.

During disassembly of the tank flange joints an unknown powdery deposit was detected on the internal surface of the tank. Since this could potentially lead to vacuum and or contamination problems a sample was taken and submitted for SEM analysis.

The O-ring test fixture was completed, assembled and instrumentation calibrated in preparation for the O-ring friction tests. O-ring friction tests were conducted both dry and wetted with alcohol and the maximum assembly load measured for the double O-ring arrangement was 300# and 80# respectively. Further O-rings tests wetted with DI water and Apeizon 'L' grease will be conducted early next week. A molybdenum disulfide (MoS_2) coated top hat is currently being manufactured and will be available for testing early next week.

Parts for the DT tripod stabilization frame (designated ORNL-1) are being fabricated and are due to be completed this week. Preliminary stability tests will be conducted on DTL-3 early next week. Parts for the collet stabilization scheme (ORNL-3) are currently being fabricated. Design improvements to ORNL-1 are currently being investigated which will improve re-alignment following dis-assembly to allow insitu replacement of the water seals if needed.

Accelerator equipment received this week included 6 gate valves, 13 vacuum gauge heads, and 20 dual ion pump controllers for the DTL/ CCL installation. In addition, partial rack assembly kits for the 6 DTL racks were received. Rack assembly is scheduled to commence 07/22/02.

RF Group

Electrical Systems Group

Survey and Alignment Group

Over the last few weeks we have been involved in supporting FE activities. We are pleased to report that the coordinate information supplied by LBNL has worked well.

We have been involved in the layout and verification of a number of target related tasks. Among them are verification of the location of the initial 78-bolt hole installation. Additionally, we are supporting the verification and layout of the target base plate.

Ongoing tasks in the RATS include the measurement/fiducialization of magnets, DTL alignment support. We have also developing new plans to improve drift tube alignment.

We have also provided: Verification of Extraction dump elevation. Investigation of discrepancy with the RTBT / Target building junction. Epoch 1 -4 Linac Floor Settlement

Cryogenics Group

Beam Diagnostics

BNL SNS Beam Diagnostics Progress Report:

General: primary focus is on preparations for next week's design reviews for all systems.

1.5.7.1 BPM: Discussions and measurements of impedances of various modes of the BPM PUEs continue. SNS PUEs are designed with sum mode impedance of 50 ohms. It has been suggested that a better approach would have been to raise the impedance such that the 'circuit impedance' defined to be $Z_0 = \sqrt{z_{sum} * z_{diff}}$ is set to 50 ohms. Preliminary conclusion of discussions with EM experts and AP is that this difference has no consequence for narrowband measurements or accelerator physics performance, and hence no implications for HEBT, Ring and RTBT PUEs. Investigation continues. Held dry run of BPM design review presentations

1.5.7.2 IPM: held dry run of IPM design review presentation.

1.5.7.3 BLM: We have received a cost estimate from one vendor to produce 300 BLM detectors based on our prototype design of \$627 each, compared with the unimproved detector cost of ~\$450. We have also received a prototype detector based on our design from a second vendor, which shows encouraging response curves from initial tests. We are still waiting for a prototype detector from the third vendor. Held dry run of BLM design review presentations

1.5.7.4 BCM: The rev 2 board stuffing continues. Held dry run of BCM design review presentations

1.5.7.5 Tune: UAL modeling and preparations for design review continue.

1.5.7.6a Carbon Wire Scanner: Contacted and pushed the vendor (Huntington) to come up with firm delivery date on the MEBT actuator upgrade. Vendor promised mid to late August delivery, which will permit reassembly and delivery to ORNL by mid-September. Actuators were removed from the previously assembled MEBT wire scanners and shipped. Collecting wire scanner information (for HEBT, ring and RTBT areas) from LANL for the beam box design.

1.5.7.6b Laser Wire Scanner: Contacted ORNL to obtain a SCL beam box for the laser wire test in BNL. ORNL will send design dwgs to BNL by 8/10/02 and will fabricate a beam box for BNL by mid October for the beginning of beam tests around late November. Collected BNL Linac dwgs, which show the equipment around the test setup upstream of the AGS LTB line.

1.5.7.7 Beam in Gap: UAL simulations and vendor discussion regarding pulsers continue.

1.5.7.8 Video Foil Monitor: Held dry run of VFM design review presentation.

LANL SNS Beam Diagnostics Progress Report:

BPM pickups: Work continues on fabrication of the DTL, CCL, and SCL BPMs. The CCL and SCL prototypes

should be welded this week. The DTL BPM parts have not arrived at ISYS yet. The SCL-style BPM for the CCL to SCL transition region (TR) will be delivered to ORNL with no flanges, identical to the rest of the SCL BPMs. The CCL-style BPM for the TR will be delivered welded on to a CCL-style beam box, with flanges on each end, and no bellows anywhere between the flanges. The beam box support design is the responsibility of ORNL.

BPM electronics: Work continued to improve the low level software and to investigate methods to allow the system to function at 60 Hz. John Power is visiting Bergoz this week to improve the analog front end design. ECAD work continues on the PCI motherboard and digital front-end modifications.

WS actuators: Fabrication continues at Huntington on the prototype and D-plate actuators. Assembly designs on all the Huntington actuators have been checked and the few changes are now being incorporated into the drawing packages.

WS electronics: The Positive HV bias daughter card went out for fabrication 17/Jul. Chris Rose will be leaving to go back to graduate school next month.

CMs: Vacuum testing is now in progress on the modified DTL CM transformers. We received 3 ea. CCL/TR-style CM transformers this week.

D-plate: Fabrication continues on the D-plate mechanical systems. Many parts are scheduled to arrive in the next couple weeks. The 4-inch BPM vendor is having problems welding in the vacuum feedthroughs. One BPM will be sent to ISYS for this welding operation.

ED/FC: Design work is underway to finish detailing the Bimba air cylinders. We will modify the design a bit based on our evaluation of some prototype parts that arrived last week.

Cabling: Negotiations continue on the disposition of the 3 ea. 6" conduits in DTL chase no. 4.

ORNL SNS Beam Diagnostics Progress Report:

As presented in the BNL report, we are modeling the HEBT, Ring BPMs and analyzing the TDR and impedance measurements sent to us by Pete Cameron. Craig has prepared two sets of HFSS simulations that confirm the BNL BPM's are not matched to 50 ohms. We agree the base band results are not affected but the 402.5 MHz signal has substantial phase shift. We will continue working with BNL to resolve the issues. Craig is also leading the DTL tank-3 cavity tuning. He handed off the electron collector design to the ORNL design team and Danny. We have received a favorable quote for the laser wire magnet. Ted Hunter is leading the effort to build a prototype by mid-September. Wim has prepared a Labview template that will be used to write the NAD low-level software. He is also working with one of the students to build a BPM test stand. We are collecting quotes to build the test stand in FY02. Dave and Joanna are working on diagnostic documentation website. Dave Thompson from the controls and Nick have demonstrated the EPICS Core IOC working with the shared memory protocol. Shared memory will replace the Active-x as soon as stability and scalability is proven. Tom Shea is at BNL for their FDR. We will present the laser wire implementation plan at the BNL three day FDR.